

Office of Technical Assistance Research Proposal
Stable Continuous Blends of Polymers

Background

Coatings used today often are some form of polymer. The properties of the coating therefore depend on the particular polymer used. If we should desire to change the properties of the coating we must consider changing the polymer. To obtain another more suitable polymer for a specific purpose would require a considerable effort. In the words of one author, "The design and synthesis of new polymers for specific applications is a time consuming and costly process. A highly successful alternative is to blend existing polymers to obtain a balance ...of the existing properties." A problem with blending however is that many polymer blends are unstable and will have a tendency to separate into different phases, possibly losing the desired properties. We propose a possible solution to this problem.

Many polymer pairs will mix together above their critical temperature forming one continuous phase of polymer blend. As the temperature is lowered, there is a tendency of the polymers to separate into different phases, with possible loss of the desired properties. We propose that while the blend is still above its critical temperature, possibly after coating, that it is exposed to e-beam radiation with the possibility that it will cross-link and prevent phase separation. Hence with one polymer pair a continuous variation of properties may be obtained.

The process will be VOC free unlike many coating processes in use today. This will have a benefit on the environment as well as worker health and safety.

Scope of Problem

Depending on how widely accepted the proposed project, the reduction in VOC emission could be significant. It is estimated that coaters emit somewhere in the neighborhood of 2,000,000 pounds of VOC's annually. There are roughly 80 coaters in Massachusetts, therefore if there should be any significant use of the new process the impact on industry would be large. It is possible that another aspect of the process may also be important on the environment but it's effect is difficult to quantify. The process may be capable of generating a whole new class of polymers, all made from blends crosslinked to make them stable. If these new polymers are in fact superior to existing ones then there could be a marked drop in the manufacture and use of conventional polymers.

Objectives

To develop a new technique utilizing polymers, that will result in a broader spectrum of performance and with a significant reduction in VOC emission.

OTA can assist in the identification of an industry partner for this project.